

Having thus described the invention, what I claim is:

1. An improved process for producing carbon monoxide from a monolith reactor comprising the steps:

5 a) feeding a feed gas comprising carbon monoxide, carbon dioxide, methane and hydrogen to a carbon dioxide separation system having at least one compressor;

b) feeding said feed gas from said carbon dioxide system to a carbon monoxide separation system;

10 c) feeding a hydrogen stream from said carbon monoxide separation system to a hydrogen separation system;

d) the improvement comprising recycling the tail gas from said hydrogen separation system and the fuel gas from said carbon monoxide separation system to said
15 compressor in said carbon dioxide separation system.

2. The process as claimed in claim 1 further comprising recycling the methane from said carbon monoxide separation system to said monolith reactor.

3. The process as claimed in claim 1 wherein said carbon dioxide separation system comprises a compressor, a CO₂ adsorption column and a CO₂ stripper column.

4. The process as claimed in claim 1 wherein said hydrogen separation system is a pressure swing adsorption system.

5. The process as claimed in claim 1 wherein said carbon monoxide separation system comprises a cold box containing a separator vessel, stripper column and carbon monoxide / methane splitter column.

6. The process as claimed in claim 1 wherein said monolith reactor comprises a metal catalyst consisting essentially of a metal supported by a ceria coating disposed on a ceramic monolith wherein said metal is selected from the group consisting of nickel, cobalt, iron, platinum, palladium, iridium, rhenium, ruthenium, rhodium and osmium said ceramic is selected from the group consisting of zirconia, alumina, yttria, titania, magnesia, ceria and cordierite and said ceria coating has a weight % between about 5% and about 30% with respect to said monolith.
7. The process as claimed in claim 1 further comprising the production of high purity hydrogen.
8. The process as claimed in claim 1 wherein said tail gas comprises about 2:1 by volume of hydrogen to carbon monoxide.
9. The process as claimed in claim 1 wherein said fuel gas comprises about 2:1 by volume of hydrogen to carbon monoxide.
10. The process as claimed in claim 1 wherein said compressor compresses said feed gas to about 10 to about 50 bar(g).
11. The process as claimed in claim 1 wherein carbon dioxide is removed from said feed gas in step (a).
12. The process as claimed in claim 1 wherein carbon monoxide is removed from said feed gas in step (b).
13. The process as claimed in claim 1 wherein hydrogen is removed from said feed gas stream as a raw H₂ stream in step (b) and further purified in step (c).

14. An improved process for producing carbon monoxide from a monolith reactor comprising the steps:

- 5 a) feeding a feed gas comprising carbon monoxide, carbon dioxide, methane and hydrogen to a carbon dioxide separation system having at least one compressor;
- b) feeding said feed gas from said carbon dioxide system to a carbon
10 monoxide separation system;
- c) feeding a hydrogen stream from said carbon monoxide separation system to a hydrogen separation system;
- 15 d) the improvement comprising recycling the tail gas from said hydrogen separation system to said compressor in said carbon dioxide separation system.

15. The process as claimed in claim 14 wherein said improvement further comprises recycling the fuel gas from said carbon monoxide separation system to said compressor in said carbon dioxide separation system.

16. The process as claimed in claim 14 further comprising recycling the methane from said carbon monoxide separation system to said monolith reactor.

17. The process as claimed in claim 14 wherein said carbon dioxide separation system comprises a compressor, a CO₂ adsorption column and a CO₂ stripper column.

18. The process as claimed in claim 14 wherein said hydrogen separation system is a pressure swing adsorption system.

19. The process as claimed in claim 14 wherein said carbon monoxide separation system comprises a cold box containing a separator vessel, stripper column and carbon monoxide / methane splitter column.

20. The process as claimed in claim 14 wherein said monolith reactor comprises a metal catalyst consisting essentially of a metal supported by a ceria coating disposed on a ceramic monolith wherein said metal is selected from the group consisting of nickel, cobalt, iron, platinum, palladium, iridium, rhenium, ruthenium, rhodium and osmium said ceramic is selected from the group consisting of zirconia, alumina, yttria, titania, magnesia, ceria and cordierite and said ceria coating has a weight % between about 5% and about 30% with respect to said monolith.

21. The process as claimed in claim 14 further comprising the production of high purity hydrogen.

22. The process as claimed in claim 14 wherein said tail gas comprises about 2:1 by volume of hydrogen to carbon monoxide.

23. The process as claimed in claim 14 wherein said fuel gas comprises about 2:1 by volume of hydrogen to carbon monoxide.

24. The process as claimed in claim 14 wherein said compressor compresses said feed gas to about 10 to about 50 bar(g).

25. The process as claimed in claim 14 wherein carbon dioxide is removed from said feed gas in step (a).

26. The process as claimed in claim 14 wherein carbon monoxide is removed from said feed gas in step (b).

27. The process as claimed in claim 14 wherein hydrogen is removed from said feed gas stream as a raw H₂ stream in step (b) and further purified in step (c).